

REMARKS

By this amendment, claims 1, 11, 15, 16 and 17 have been amended. Claims 1-17 remain in the application. This application has been carefully considered in connection with the Examiner's Action. Reconsideration, and allowance of the application, as amended, is requested.

Rejection under 35 U.S.C. §103

Claim 1 recites a method of generating, from a single view input image, a depth map comprising depth values representing distances to a viewer, for respective pixels of the image, the method comprising:

computing cost values that comprise respective measures of a number of and extent of transitions in luminance and/or color and/or color components for pixels of the image on a path related to a spatial disposition of objects in the image, wherein said computing includes computing a cost value for a first one of the pixels of the image by accumulating differences between luminance and/or color and/or color component values of pairs of neighboring connected pixels at transitions which are disposed on a path from the first one of the pixels to a second one of the pixels, wherein the second one of the pixels belongs to a predetermined subset of the pixels of the image; and

assigning a depth value of depth values corresponding to the first one of the pixels on basis of the cost value.

Support for the amendment to claim 1 (as well as for claims 15-17) can be found in the specification at least on page 2, lines 11-25; page 6, line 30-34; page 7, line 1-9, and 20-23; page 8, lines 18-22 (equation 1); and page 9, lines 21-24.

As presented, claim 1 clearly articulates a novel and non-obvious method of generating a depth map. For example, as discussed in the specification on page 2, lines 11-25, the claimed method is based on the observation that objects in a scene to be

imaged **(1)** have different sizes, luminances, and colors and **(2)** have a certain spatial disposition. By determining for the pixels of the image **(3)** the number of and **(4)** extent of **(5)** transitions in luminance and/or color **(6)** on a path from the respective pixels to a predetermined location of the image, **(7)** respective measures (that is, *cost values*) related to the spatial disposition of the objects in the scene can be achieved. Computation of the cost value is based on an accumulation of pixel (e.g., luminance and/or color and/or color component) value differences being allocated to pixels being located on a path from a first pixel to a second pixel (see the specification on page 8, lines 18-22 and page 9, lines 21-24). Depth values are assigned on the basis of said cost values. In addition, it should be noted that an image background also forms one or more objects.

Claims 1-4 and 6-13 and 15-17 were rejected under 35 U.S.C. §103(a) as being unpatentable over Wilinski et al. (WIPO Publication No. 02/095680; hereinafter "**Wilinski**") in view of Zheng et al. (O. Zheng, R. Chellappa; Estimation of Illuminant Direction, Albedo, and Shape from Shading; IEEE Transactions of Pattern Analysis and Machine Intelligence, Vol. 13, July 1991; hereinafter "**Zheng**") and Wu et al. (Z. Wu, L.Li; A Line-Integration Based Method for Depth Recovery from Surface Normals; IEEE, November 1988; hereinafter "**Wu**"). With respect to claim 1, Applicant respectfully traverses this rejection on the grounds that these references are defective in establishing a prima facie case of obviousness.

As the PTO recognizes in MPEP § 2142:

... The examiner bears the initial burden of factually supporting any prima facie conclusion of obviousness. If the examiner does not produce a prima facie case, the applicant is under no obligation to submit evidence of nonobviousness ...

It is submitted that, in the present case, the examiner has not factually supported a prima facie case of obviousness for at least the following reasons.

1. Even When Combined, the References Do Not Teach the Claimed Subject Matter

The **Wilinski, Zheng** and **Wu** references cannot be applied to reject claim 1 under 35 U.S.C. §103 which provides that:

A patent may not be obtained ... if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains ... (Emphasis added)

Thus, when evaluating a claim for determining obviousness, all limitations of the claim must be evaluated. However, since neither **Wilinski, Zheng** nor **Wu** teaches a method of generating a depth map that includes computing “(I) cost values that comprise ... measures of (i) a number of and (ii) extent of transitions in luminance and/or color and/or color components *for pixels* of the image on a path”, *the cost values being “related to a spatial disposition of objects in the image”*, and wherein computing includes “computing a cost value for a first one of the pixels ... by accumulating differences between ... values [i.e., luminance and/or color and/or color component] of pairs of neighboring connected pixels at transitions which are disposed on a path from the first one of the pixels to a second one of the pixels, wherein the second one of the pixels belongs to a predetermined subset of the pixels of the image and (II) assigning a depth value ... corresponding to the first one of the pixels on basis of the cost value” (emphasis added) as is claimed in claim 1, it is impossible to render the subject matter of claim 1 as a whole obvious, and the explicit terms of the statute cannot be met.

With respect to **Wilinski**, the examiner indicates in the office action that **Wilinski** teaches “assigning a depth value in a ‘first group’ of depth values corresponding to the to a pixel so that pixels belonging to the same image segment are assigned the same

group of pixel values (see p. 6, lines 1 and 2 for seed values composing a pixel; see p. 8, lines 31-34 and p. 9. Lines 1 and 2 for storing the depth values of the seed pixels; see p. 10, lines 26-28 for assigning to a pixel the depth value of the segment it belongs to)." (*Emphasis added.*) (See the Office Action mailed 08/24/2009, page 2, fourth paragraph to page 3, lines 1-4). It is unknown to the Applicants how the Examiner is taking this disclosure of Wilinski and deeming that this is equivalent to "assigning a depth value ... of depth values corresponding to the first one of the pixels on basis of the cost value" wherein the cost value is computed for the "first one of the pixels ... by accumulating differences between values [i.e., luminance and/or color and/or color component] of pairs of neighboring connected pixels at transitions which are disposed on a path from the first one of the pixels to a second one of the pixels, wherein the second one of the pixels belongs to a predetermined subset of the pixels of the image" as recited in claim 1.

With respect to **Zheng**, the examiner indicates in the office action that **Zheng** teaches "a method to obtain shape from shading using contours (see abstract; see p. 684, 1st col., 2nd par.), where the value of the intensity difference across an edge is determined and if it is above a threshold, detects a relative depth variation between the segments (see p. 684, 2nd col., 3rd and 4th pars.)" and "determining the depth of edges in the image by examining intensity differences across edges." (See the Office Action mailed 08/24/2009, page 3, last two lines of the page; and page 4, lines 1-2 and 4-5). It is unknown to the Applicants how this can be considered to teach or suggest "computing a cost value for a first one of the pixels ... by accumulating differences between values [i.e., luminance and/or color and/or color component] of pairs of neighboring connected pixels at transitions which are disposed on a path" as recited in claim 1.

With respect to **Wu**, the examiner indicates in the office action that **Wu** teaches "[r]econstructing shape information from shading through the use of paths ... in Wu (see abstract)." (See the Office Action mailed 08/24/2009, page 4, last two lines of the page;

and page 5, line 1). In contrast, the abstract of **Wu** discloses, in part, a "method for constructing a depth map from surface normals. In this ... depth recovery method, an arbitrary depth must be first preset for a point somewhere in the image, then path-independent line integrals are computed to get the relative depths at every point in the image. ... [E]fficiency was tested using surface normals obtained by shape from shading algorithm." (Emphasis added.) It is unknown to the Applicants how this can be considered to teach or suggest "computing a cost value for a first one of the pixels ... by accumulating differences between values [i.e., luminance and/or color and/or color component] of pairs of neighboring connected pixels at transitions which are disposed on a path" as recited in claim 1.

For this reason, the examiner's burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection under 35 U.S.C. §103 should be withdrawn.

2. The Combination of References is Improper

Assuming, arguendo, that the above argument for non-obviousness does not apply (which is clearly not the case based on the above), there is still another compelling reason why the **Wilinski**, **Zheng** and **Wu** references cannot be applied to reject claim 1 under 35 U.S.C. §103.

§ 2142 of the MPEP also provides:

...the examiner must step backward in time and into the shoes worn by the hypothetical 'person of ordinary skill in the art' when the invention was unknown and just before it was made.....The examiner must put aside knowledge of the applicant's disclosure, refrain from using hindsight, and consider the subject matter claimed 'as a whole'.

Here, neither **Wilinski**, **Zheng** nor **Wu** teaches, or even suggests, the desirability of the combination since no one of the references teach computing "cost values that comprise ... measures of a number of and extent of transitions in luminance and/or color and/or color components for pixels of the image on a path", the cost values being

*"related to a spatial disposition of objects in the image", and wherein computing includes "computing a **cost value** for a first one of the pixels ... by accumulating differences between values [i.e., luminance and/or color and/or color component] of pairs of neighboring connected pixels at transitions which are disposed on a path from the first one of the pixels to a second one of the pixels, wherein the second one of the pixels belongs to a predetermined subset of the pixels of the image and assigning a depth value ... corresponding to the first one of the pixels on basis of the **cost value**" as specified above and as claimed in claim 1.*

Thus, it is clear that none of the references provides any incentive or motivation supporting the desirability of the combination. Therefore, there is simply no basis in the art for combining the references to support a 35 U.S.C. §103 rejection.

In this context, the MPEP further provides at § 2143.01:

The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.

In the above context, the courts have repeatedly held that obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination.

In the present case it is clear that the combination presented in the Office Action arises solely from hindsight based on the invention without any showing, suggestion, incentive or motivation in either reference for the combination as applied to claim 1. Therefore, for this reason, the examiner's burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection under 35 U.S.C. §103 should be withdrawn.

Accordingly, claim 1 is allowable and an early formal notice thereof is requested. Claims 2-4 and 6-13 depend from and further limit independent claim 1 and therefore are allowable as well. The 35 U.S.C. §103(a) rejection thereof has now been overcome. Withdrawal of the rejection is respectfully requested.

Claims 15, 16 and 17 contain limitations similar to those of claim 1. Accordingly, for similar reasons as stated with respect to overcoming the rejection of claim 1, claims 15, 16 and 17 are believed allowable and an early formal notice thereof is requested. The 35 U.S.C. § 103(a) rejection thereof has now been overcome. Withdrawal of the rejection is respectfully requested.

Claim 5 stands rejected under 35 U.S.C. §103(a) as being unpatentable over **Wilinski** in view of **Zheng** and **Wu** as applied to claim 1 above, and further in view of Cahill et al. (U.S. Patent Publication No. 2004/0062439, hereinafter "**Cahill**"). Applicant respectfully traverses this rejection for at least the following reason. Claim 5 depends from and further limits allowable independent claim 1 and therefore is allowable as well. The 35 U.S.C. §103(a) rejection thereof has now been overcome. Withdrawal of the rejection is requested.

Claim 14 stands rejected under 35 U.S.C. §103(a) as being unpatentable over **Wilinski** in view of **Zheng** and **Wu** as applied to claim 12 above, and further in view of Nakatsuna et al. (U.S. Patent Publication No. 2002/0154116; hereinafter "**Nakatsuna**"). Applicant respectfully traverses this rejection for at least the following reason. Claim 14 depends from and further limits dependent claim 12, which is dependent from allowable independent claim 1 and therefore is allowable as well. The 35 U.S.C. §103(a) rejection thereof has now been overcome. Withdrawal of the rejection is requested.

Conclusion

Except as indicated herein, the claims were not amended in order to address issues of patentability and Applicants respectfully reserve all rights they may have under the Doctrine of Equivalents. Applicants furthermore reserve their right to reintroduce subject matter deleted herein at a later time during the prosecution of this application or a continuation application.

It is clear from all of the foregoing that independent claims 1, 15, 16 and 17 are in condition for allowance. Claims 2-14 depend from and further limit independent claim 1 and therefore are allowable as well.

The amendments herein are fully supported by the original specification and drawings; therefore, no new matter is introduced. An early formal notice of allowance of claims 1-17 is requested.

Respectfully submitted,

/Michael J. Balconi-Lamica/

Michael J. Balconi-Lamica
Registration No. 34,291
for Edward Goodman, Reg. No. 28,613

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Philips Intellectual Property & Standards
345 Scarborough Road
Briarcliff Manor, New York 10510
Telephone: 914-333-9611
Facsimile: 914-332-0615
File: NL050010US1

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